

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Update to Parts 2 and 25 Concerning Non-	)	IB Docket No. 16-408
Geostationary, Fixed-Satellite Service Systems	)	
and Related Matters	)	

**COMMENTS OF VIASAT, INC.**

Christopher Murphy  
Associate General Counsel, Regulatory  
Affairs  
Daryl T. Hunter  
Senior Director, Regulatory Affairs  
Christopher Hofer  
Director, Regulatory Affairs  
VIASAT, INC.  
6155 El Camino Real  
Carlsbad, CA 92009

John P. Janka  
Elizabeth R. Park  
Jarrett S. Taubman  
LATHAM & WATKINS LLP  
555 Eleventh Street, NW, Suite 100  
Washington, DC 20004  
  
*Counsel to ViaSat, Inc.*

February 27, 2017

## Summary

ViaSat supports the Commission's efforts to: (i) provide greater operational flexibility for FSS satellites in the geostationary-satellite orbit (GSO), and (ii) update, clarify, and streamline the licensing framework for non-geostationary orbit (NGSO) satellite systems. In particular, ViaSat applauds the Commission's efforts to codify certain informal practices and policies reflected in individual licensing decisions that have developed over time. Among other things, these efforts should provide greater clarity to satellite operators and ensure that they work from a common set of assumptions as they seek to efficiently use limited spectrum resources.

The *NPRM* represents the first attempt to comprehensively reform the Ka-Band Plan and NGSO licensing rules in nearly two decades. During that period, NGSO and GSO technologies—and the operating environment more generally—have evolved significantly. In fact, the Commission is faced with the possibility of authorizing eleven NGSO systems in the current Ka-band processing round, and a yet-to-be-determined number in the V-band processing round. Although the *NPRM* acknowledges the need to take this evolution into account in certain contexts, ViaSat recommends that it be taken into account more broadly. Specifically, ViaSat recommends that the Commission reexamine the Ka-Band Plan and its NGSO licensing framework more comprehensively. Among other things, ViaSat recommends that the Commission:

- **More broadly consider ways to promote efficient use of underutilized Ka-band resources.** For example, the 19.4-19.6 GHz and 29.1-29.25 GHz band segments are currently utilized in the United States for satellite services only by two entities. The Commission should carefully consider whether this spectrum could be put to additional, and more efficient, uses by GSO FSS operators.
- **Examine the relevance of decades-old ITU limits to the very different set of circumstances existing today.** Managing NGSO interference into GSO systems should be a critical element of this proceeding. Although “EPFD” limits can be an effective means of facilitating NGSO/GSO sharing, it is not enough to assume that

the existing ITU limits are adequate. Those ITU limits: (i) are based on the assumption that no more than 3.5 NGSO systems will be operating on a co-frequency basis (not the eleven systems with about 4,000 satellites proposed in the pending Ka-band processing round); and (ii) do not take into account the significant technological changes in GSO networks over the past two decades that make them more spectrally efficient.

- **Adopt effective mechanisms for fully protecting GSO systems from NGSO interference.** No mechanism has been proposed to ensure that any aggregate EPFD limits are honored and that critical GSO operations are protected. No rule has been proposed to limit aggregate EPFD in the uplink direction. These matters must be carefully examined and addressed in this proceeding.
- **Examine the extent to which changing NGSO licensing rules for some could constrain the ability of others to provide innovative services.** For example, expanding the use and effectiveness of the “avoidance of in-line interference” mechanism, and requiring operators to meet restrictive earth station performance standards, could also constrain the ability of some NGSO operators to serve the public.
- **Consider how relaxing the NGSO milestone requirement could adversely affect the NGSO sharing environment.** Allowing operators to take nine years to deploy mega-constellations could significantly constrain the capacity and coverage of other, smaller NGSO systems—especially if the “avoidance of in-line interference” mechanism is used as the means of assigning spectrum.
- **Address the inequitable impact on current processing-round applicants of changing baseline licensing rules after the filing window has closed.** Applicants in the current NGSO processing rounds had to design their systems to comply with the global coverage requirement or risk dismissal. Thus, they effectively were precluded from proposing different constellation types. Changing this rule now would benefit only those applicants that chose not to comply at the outset. Disguising waivers of longstanding, baseline, processing-round qualifications through *post-hoc* rule changes would be fundamentally unfair to the other applicants.

ViaSat recommends that the scope of the Commission’s inquiry be expanded to account for these issues, many of which are critical for setting the terms on which limited spectrum resources will be used by a variety of NGSO systems with expected lifetimes of fifteen years or more. If these issues are not addressed now, there may be no realistic opportunity to address them in the future. ViaSat believes the Commission can address most, if not all, of these items within the context of its *NPRM*, and also supports the issuance of a further Commission inquiry

as may be necessary to ensure that these critical issues are evaluated fully, and in an informed and reasoned manner.

## Table of Contents

I.	INTRODUCTION .....	1
II.	PROVIDING GREATER ACCESS TO UNDERUTILIZED KA-BAND SPECTRUM IS ESSENTIAL .....	6
A.	ViaSat Supports Efforts To Facilitate Increased Use of the 17.8-18.3 GHz, 18.8-19.3 GHz, and 28.6-29.1 GHz Band Segments .....	7
B.	GSO and NGSO Access to 19.3-19.7 GHz and 29.1-29.5 GHz Should Be Examined .....	9
C.	NGSO-GSO Sharing Terms Should Be Fully Examined at 17.8-18.6 GHz, 19.7-20.2 GHz and 29.5-30 GHz .....	10
III.	DEVELOPING APPROPRIATE RULES TO PROTECT GSO NETWORKS FROM NGSO INTERFERENCE IS CRITICAL.....	12
A.	Managing Aggregate Interference from NGSO Systems into GSO Networks Is Essential.....	13
B.	Aggregate Limits for <i>Each Direction</i> Must Be Established and a Suitable Enforcement Mechanism Must Be Developed .....	14
C.	Any Aggregate EPFD “Allowances” Must Be Apportioned Across Eleven or More NGSO Systems in the Ka Band .....	15
D.	Prior Experience with One Type of NGSO System Has Limited Value in Managing the Many Different NGSO Systems Proposed to the Commission .....	16
E.	The Continued Adequacy of Existing ITU Limits Cannot Be Assumed.....	18
IV.	CHANGING CERTAIN NGSO LICENSING RULES COULD CONSTRAIN THE ABILITY TO PROVIDE INNOVATIVE NGSO SERVICES .....	19
V.	RELAXING THE NGSO MILESTONE REQUIREMENT COULD ADVERSELY AFFECT THE NGSO SHARING ENVIRONMENT .....	21
VI.	SIGNIFICANT NGSO RULE CHANGES COULD INEQUITABLY AFFECT APPLICANTS IN THE CURRENT NGSO PROCESSING ROUNDS .....	23
VII.	CONCLUSION.....	24

Exhibit 1: Impact of Mutual Avoidance on Coverage

Exhibit 2: Impact of Mutual Avoidance on Capacity

**Before the  
Federal Communications Commission  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Update to Parts 2 and 25 Concerning Non-	)	IB Docket No. 16-408
Geostationary, Fixed-Satellite Service Systems	)	
and Related Matters	)	

**COMMENTS OF VIASAT, INC.**

ViaSat, Inc. submits these comments in response to the *Notice of Proposed Rulemaking* adopted on December 14, 2016 in the above-captioned proceeding (“*NPRM*”), in which the Commission proposes “revisions to certain of [its] rules and policies governing satellite services, prompted by a planned new generation of large, non-geostationary satellite orbit (NGSO), fixed-satellite service (FSS) systems” and to “update certain rules governing operation of FSS space stations in the geostationary-satellite orbit (GSO) to enable greater operational flexibility.”<sup>1</sup>

**I. INTRODUCTION**

ViaSat is a leading provider of communications solutions to U.S. businesses, consumers, and government users across a wide range of technologies, both satellite and terrestrial. ViaSat currently provides satellite broadband services using an existing fleet of GSO satellites, and is expanding its existing capacity with additional GSO satellites featuring even more advanced technical capabilities.

ViaSat is seeking to augment its GSO offerings with NGSO capabilities using the VIASAT-NGSO satellite network.<sup>2</sup> Among other things, ViaSat’s NGSO satellite network would allow it to utilize spectrum resources more intensively and to develop and offer innovative

---

<sup>1</sup> *NPRM* at ¶ 1.

<sup>2</sup> *See* IBFS File No. SAT-LOI-20161115-00120 (filed Nov. 15, 2016).

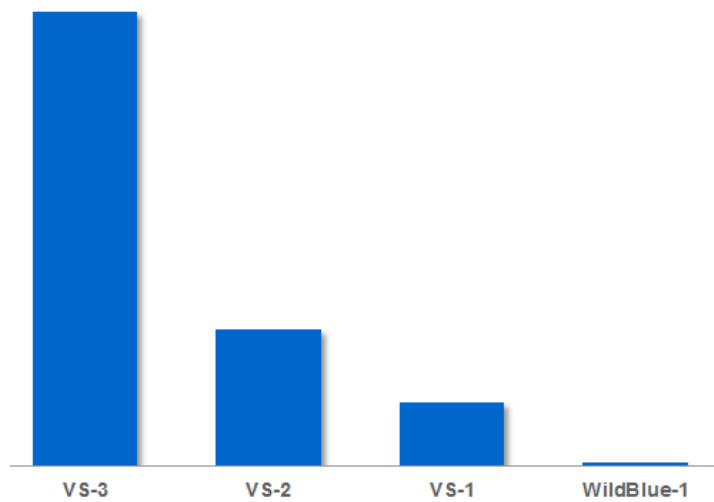
satellite-based communications services that would combine the high throughput available through ViaSat's existing and planned GSO satellites with the enhanced coverage and low latency available through an NGSO platform.

ViaSat supports the Commission's efforts to: (i) provide greater operational flexibility for GSO satellites; and (ii) update, clarify, and streamline its Ka-Band Plan and its licensing framework governing NGSO systems. In particular, ViaSat applauds the Commission's desire to codify informal practices and policies reflected in certain individual licensing decisions that have developed over time. Among other things, these efforts should provide greater clarity to satellite operators and ensure that they work from a common set of assumptions as they seek to efficiently use limited spectrum resources.

The *NPRM* represents the first attempt to comprehensively reform the Ka-Band Plan and NGSO licensing rules in nearly two decades. During that period, NGSO and GSO technologies—and the operating environment more generally—have evolved significantly. Although the *NPRM* acknowledges this evolution in certain contexts, ViaSat recommends that the Commission reexamine the Ka-Band Plan and its NGSO licensing framework more comprehensively in light of this evolution.

Among other things, since the existing regulatory framework was established, multiple generations of GSO satellites have been developed and deployed that provide ever-increasing amounts of capacity, as depicted below in descending order:

### Satellite Capacity (Gbit/s)



These system designs respond to the growing demands of satellite broadband users for service quality that compares favorably to terrestrial alternatives. ViaSat’s constantly improving technologies now enable it to provide broadband service with an overall user satisfaction rating on par with that of many terrestrial service providers. Therefore, it is not surprising that about one-third of ViaSat’s broadband customers have switched to satellite from terrestrial alternatives.

While the first version of satellite broadband services in the Ka band supported speeds that did not exceed 1.5 Mbit/s,<sup>3</sup> today’s offerings are far more robust and bandwidth intensive. Specifically, ViaSat currently offers 25/3 Mbit/s speeds in many areas of the country,<sup>4</sup> and will be expanding its 25/3 Mbit/s coverage—and offering even higher speeds throughout its service

---

<sup>3</sup> See *WildBlue High-Speed Internet via Satellite Triples Capacity with New Satellite* (Mar. 20, 2007), available at <http://www.4wildblue.com/News.aspx> (announcing March 2007 commencement of commercial service over WildBlue-1, featuring “download speeds of up to 1.5 Mbps, competitive with other high-speed services available in the market today”).

<sup>4</sup> See *ViaSat Unveils Fastest Home Satellite Internet Service in the U.S. with the New Exede WiFi Modem and a 25 Mbps Plan* (Nov. 18, 2015), available at <http://investors.viasat.com/releasedetail.cfm?ReleaseID=943346>.



footprint—following the launch of ViaSat-2 in April 2017 and the expected launch of ViaSat-3 in 2019. Indeed: (i) ViaSat-2 will support peak speeds of 100-plus Mbit/s; and (ii) ViaSat-3 will provide over one terabit per second (1,000 Gbit/s) of throughput and burst speeds in the 1 Gbit/s range.<sup>5</sup>

Moreover, ground-breaking satellite broadband technology developed in the past two decades makes it possible for consumers to enjoy high-speed broadband connections on board commercial airlines, and to stream services such as Netflix and Amazon Video while in flight. These broadband connections are being provided to over 1,100 aircraft today, including 555 commercial aircraft and many hundreds of business and government aircraft—most notably, Air Force One. These connections will be provided to over 750 more commercial aircraft in the near future.<sup>6</sup> In total, nearly one million personal electronic devices connect each month through these satellite broadband connections to aircraft.

Additional innovative satellite technologies continue to be developed, including technologies that support advanced mobile capabilities on vehicles, high-capacity terrestrial wireless traffic offloading and backhaul, and other networking capabilities that will be part of a highly connected 5G world.

---

<sup>5</sup> See, e.g., *ViaSat Announces Third Quarter Fiscal Year 2016 Results* (Feb. 9, 2016), available at <http://investors.viasat.com/releasedetail.cfm?ReleaseID=954130>.

<sup>6</sup> See, e.g., *ViaSat Announces Third Quarter Fiscal Year 2017 Results* (Feb. 9, 2017), available at <http://investors.viasat.com/releasedetail.cfm?ReleaseID=1011337>; *ViaSat Announces Second Quarter Fiscal Year 2016 Results* (Nov. 9, 2015), available at <http://investors.viasat.com/releasedetail.cfm?ReleaseID=941679>; *ViaSat Selected for In-flight Wi-Fi Service on American Airlines 737 MAX Fleet* (Jun. 3, 2016) available at <http://investors.viasat.com/releasedetail.cfm?ReleaseID=974201>; *ViaSat to provide Global In-flight Internet and Connectivity Services to Air Force One and other U.S. Government Senior Leader Aircraft* (Jul. 25, 2016), available at <http://investors.viasat.com/releasedetail.cfm?ReleaseID=980894>.

Achieving these new levels of spectral efficiency and developing these innovative services has required billions of dollars of investment in,<sup>7</sup> and fundamental changes to, GSO network designs. Among other things, ViaSat's third-generation broadband spacecraft design is based on a larger scale of frequency reuse than ever before. Those design elements are essential to enable continued reductions in the "cost per bit" of broadband service, to support the growing numbers of satellite broadband subscribers, and to satisfy the insatiable demand for video streaming that consumes ever-increasing amounts of satellite capacity.

The *NPRM* acknowledges this technological evolution in certain contexts, and proposes to evaluate the appropriateness of making certain rule changes in response. ViaSat supports that approach, which is consistent with the Commission's vision when it first allocated 2.5 GHz of the Ka band in each direction for satellite services after: (i) wisely predicting the increased demand for satellite-based services that exists today;<sup>8</sup> and (ii) correctly recognizing that satellite operations might not be able to be "fully and economically accommodated in the only frequency bands [then] available."<sup>9</sup>

ViaSat recommends that the Commission reexamine its Ka-Band Plan and its NGSO licensing framework more comprehensively in light of both the technological evolution

---

<sup>7</sup> See Written Testimony of Michael Rapelyea, Vice President for Government Affairs, ViaSat, Inc. before the Senate Committee on Commerce, Science & Transportation, Hearing on Ensuring Intermodal USF Support for Rural America, at 5-6 (Feb. 4, 2016).

<sup>8</sup> See *Proposed Frequency Allocations and Radio Treaty Matters*, 37 Fed. Reg. No. 151, 15714-717, 15733 (Aug. 4, 1972); *corrected at* 37 Fed. Reg. 25175 (Nov 28, 1972); *Frequency Allocations and Radio Treaty Matters*, 38 Fed. Reg. No. 40, 5565, 5595-7 (Mar. 1, 1973).

<sup>9</sup> *Establishment of Domestic Communication-Satellite Facilities*, Further Notice of Inquiry and Notice of Proposed Rulemaking, 25 FCC 2d 718, at ¶ 2 (1970) (citing *Establishment of Domestic Communication-Satellite Facilities*, Report and Order, 22 FCC 2d 86, at ¶ 11 (1970)).

discussed above, and the Commission’s stated purpose in first allocating the Ka band for satellite services. In particular, ViaSat recommends that this proceeding also examine: (i) other ways to promote efficient use of underutilized Ka-band spectrum resources—including consideration of the 19.4-19.6 GHz and 29.1-29.25 GHz band segments; (ii) the adequacy of existing International Telecommunication Union (“ITU”) limits, and whether they need to be updated to account for the evolution of GSO and NGSO technologies over the past two decades; (iii) how to ensure compliance with limits that are essential to protecting GSO networks from NGSO interference; (iv) the ways that changing certain NGSO licensing rules to accommodate certain NGSO system designs could constrain the ability of other NGSO systems to provide innovative services; (v) how relaxing the NGSO milestone requirement could adversely impact the NGSO sharing environment; and (v) how changing baseline NGSO licensing rules after the close of the current NGSO processing rounds could inequitably and adversely affect some applicants in those processing rounds.

The Commission can address most, if not all, of these items in the context of the *NPRM*. To the extent necessary, ViaSat supports a further Commission inquiry to ensure these critical issues are evaluated fully, and in an informed and reasoned manner.

## **II. PROVIDING GREATER ACCESS TO UNDERUTILIZED KA-BAND SPECTRUM IS ESSENTIAL**

ViaSat appreciates the Commission’s efforts to modify the Ka-Band Plan to codify existing practices and ensure that the Plan reflects previously authorized satellite spectrum uses.<sup>10</sup> Codification should provide greater transparency and ensure that relevant stakeholders

---

<sup>10</sup> See *NPRM* at ¶ 8.

work from a common, baseline understanding of potential spectrum uses in a given band segment.<sup>11</sup> It also should help to facilitate more intensive use of Ka-band spectrum resources.

That said, the scope of the efforts to modify the Ka-Band Plan in the *NPRM* appears both under- and over-inclusive. On the one hand, there are compelling reasons to facilitate greater access to portions of the Ka band not specifically addressed in the *NPRM* (including consideration of the 19.4-19.6 GHz and 29.1-29.25 GHz band segments). On the other hand, it would be premature to implement certain of the changes proposed by the *NPRM* before the Commission has fully addressed the terms of certain types of NGSO-GSO and NGSO-NGSO spectrum sharing, as discussed below in greater detail.

**A. ViaSat Supports Efforts To Facilitate Increased Use of the 17.8-18.3 GHz, 18.8-19.3 GHz, and 28.6-29.1 GHz Band Segments**

ViaSat supports the *NPRM* proposals with respect to the 17.8-18.3 GHz, 18.8-19.3 GHz, and 28.6-29.1 GHz band segments, except for the proposal to limit use of the 17.8-18.3 GHz downlink band segment to individually licensed earth stations.

**17.8-18.3 GHz.** ViaSat supports the Commission's proposal to restore the previously deleted allocation for FSS downlinks in the 17.8-18.3 GHz band segment, even if FSS use is designated as being on a secondary basis to the fixed service.<sup>12</sup> As the Commission notes, several satellite networks have been authorized to use this band on a non-interference basis after demonstrating that they would adequately protect fixed-service licensees by complying with the ITU's pfd limits, which were developed with input from the terrestrial industry.<sup>13</sup> In restoring the deleted allocation, the Commission should make clear that the allocation permits use of the

---

<sup>11</sup> *Id.* at ¶ 14.

<sup>12</sup> *Id.* at ¶ 9.

<sup>13</sup> *Id.*

band segment without limiting it to any particular type of earth station. Because this band segment would be used for downlinks, and receiving earth station operations are passive, the nature of the earth station that is receiving satellite signals transmitted to the Earth's surface has no bearing on spectrum compatibility with terrestrial services in the band. Stated another way, the nature and number of earth stations passively receiving satellite signals does not present any risk to terrestrial services in this context. Thus, there is no reason to constrain FSS use of the band segment by limiting it to individually-licensed earth stations.

Indeed, the Commission reached a similar conclusion in granting a waiver of the United States Table of Frequency Allocations to enable the reception of satellite signals by large numbers of earth stations, on an unprotected, non-conforming basis, in other spectrum that otherwise was not available for such purposes. In doing so the Commission found that allowing such operations on a non-interference basis:

[W]ould not undermine the rule's purpose because it involves only passive receive-only earth stations that are not capable of causing interference into FS stations operating in this band. Further, because [the operator] has agreed to accept any level of interference from FS stations into its receive-only earth stations' operations in the extended Ku-bands, FS operators will not be required to coordinate their station operations with the . . . receive-only earth stations' operations. Under these circumstances, we determine that additional coordination burden would not be placed upon FS operators and that their ability to expand service in the future would not in any manner be restricted.<sup>14</sup>

There is no reason to reach a different conclusion here and limit secondary use of the 17.8-18.3 GHz band segment to individually licensed earth stations.

**18.8-19.3 GHz and 28.6-29.1 GHz.** ViaSat supports the Commission's proposal to elevate GSO uses of the 18.8-19.3 GHz and 28.6-29.1 GHz band segments to co-primary status

---

<sup>14</sup> *EchoStar Satellite LLC*, 20 FCC Rcd 930, at ¶ 13 (2004).

with NGSO uses.<sup>15</sup> GSO and NGSO systems already routinely coordinate co-primary operations at 18.8-19.3 GHz and 28.6-29.1 GHz internationally. There is no reason why such coordination could not be effectively concluded in the United States as well.

**B. GSO and NGSO Access to 19.3-19.7 GHz and 29.1-29.5 GHz Should Be Examined**

ViaSat supports the Commission's proposal to permit GSO and NGSO operations in the 19.3-19.4 GHz and 19.6-19.7 GHz band segments. These band segments are not being used by NGSO MSS feeder links, even though they are currently designated for this purpose. Terrestrial fixed-service operations would be adequately protected from FSS downlinks through the pfd limits in Sections 25.208(c) and (e).<sup>16</sup>

ViaSat also supports the Commission's proposal to allow NGSO operations in the 29.3-29.5 GHz band segment on an unprotected, non-interference basis with respect to GSO operations. The 29.3-29.5 GHz band segment is already available to GSO FSS.<sup>17</sup> Thus, there should be no change in the priority or protection of GSO uses in this band segment.

However, the Commission's proposals for the 19.3-19.4 GHz, 19.6-19.7 GHz, and 29.3-29.5 GHz band segments do not go far enough—they do not address the remainder of the 19.3-19.7 GHz and 29.1-29.5 GHz band segments. In particular, the 19.4-19.6 GHz and 29.1-29.25 GHz band segments—which are utilized in the United States by Iridium for NGSO MSS feeder links and by one GSO FSS system but otherwise are largely fallow—would be left underutilized, to the detriment of the public.

---

<sup>15</sup> *NPRM* at ¶ 12. Currently GSO is secondary to NGSO in the 28.6-29.1 GHz band segment and does not have any designation in the 18.8-19.3 GHz band segment.

<sup>16</sup> 47 C.F.R §§ 25.208(c) and (e).

<sup>17</sup> The Ka-Band Plan currently provides for GSO FSS use of the 29.3-29.5 GHz band segment. *See NPRM* at Appx. B.

ViaSat therefore urges the Commission to fully and expeditiously examine the ability of GSO FSS operations to be conducted in the 19.4-19.6 GHz and 29.1-29.25 GHz<sup>18</sup> segments and NGSO FSS operations to be conducted in the 19.4-19.6 GHz and 29.1-29.3 GHz band segments (with NGSO on a non-interference basis with respect to GSO), while protecting NGSO MSS feeder link operations. Doing so could allow this spectrum to be used more efficiently. Indeed, when the Commission designated these band segments for NGSO MSS use, it anticipated that multiple satellite systems would operate there on a shared basis.<sup>19</sup> Yet, today Iridium is only one of two satellite system operators using this spectrum in the United States. Because Iridium's NGSO MSS feeder link stations are limited in number, it should be relatively easy to coordinate shared use of the band with FSS operators. Indeed, the Commission has previously authorized another GSO FSS operator to use this spectrum after concluding that doing so would not create a risk of harmful interference into Iridium's operations.<sup>20</sup>

**C. NGSO-GSO Sharing Terms Should Be Fully Examined at 17.8-18.6 GHz, 19.7-20.2 GHz and 29.5-30 GHz**

As detailed below, in light of the new operating environment presented by the possible introduction of eleven new NGSO systems in the 17.8-18.6 GHz, 19.7-20.2 GHz and/or 29.5-30

---

<sup>18</sup> The Ka-Band Plan currently provides for GSO FSS use of the 29.25-29.3 GHz band segment. *See NPRM* at Appx. B.

<sup>19</sup> *See Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services*, First Report and Order, 11 FCC Rcd 19005, at ¶ 66 (1996).

<sup>20</sup> *See Inmarsat Mobile Networks, Inc.*, 30 FCC Rcd 2770 (2015) (authorizing Inmarsat's use of 19.4-19.6 GHz and 29.1-29.25 GHz); 30 FCC Rcd 7295 (2015) (granting partial reconsideration to clarify certain conditions applicable to Inmarsat).

GHz band segments,<sup>21</sup> ViaSat recommends that the Commission carefully examine the impact that operating environment may have on the prospects of NGSO-GSO sharing before simply codifying the *ad hoc* practice developed to allow one particular type of NGSO FSS constellation to operate on an unprotected basis with respect to GSO FSS networks in those band segments. Certain of those band segments currently are designated only for GSO FSS,<sup>22</sup> and, as discussed below: (i) it cannot be assumed that the ITU's effective power flux density ("EPFD") limits provide adequate protection from NGSO interference because those limits were developed almost 20 years ago in a very different operating environment; (ii) no mechanism has been proposed to ensure that any aggregate EPFD limits are honored and that critical GSO operations are protected; and (iii) no rule has been proposed to limit aggregate EPFD in the uplink direction. It is critical that the ITU EPFD limits be re-examined to ensure that they are adequate and appropriate in light of both the technological developments that have occurred since they first were adopted in 2000, as well as proposals in the current Ka-band NGSO processing round for eleven separate NGSO systems, operating co-frequency in portions of the Ka band, and consisting of about 4,000 NGSO spacecraft operating in a wide variety of orbits.

---

<sup>21</sup> See The Boeing Company, IBFS File No. SAT-LOA-20161115-00109 (filed Nov. 15, 2016) ("Boeing Ka-Band Application"); Audacy Corporation, IBFS File No. SAT-LOA-20161115-00117 (filed Nov. 15, 2016) ("Audacy Application"); Karousel LLC, IBFS File No. SAT-LOA-20161115-00113 (filed Nov. 15, 2016); LeoSat MA, Inc., IBFS File No. 20161115-00112 (filed Nov. 15, 2016); O3b Limited, IBFS File Nos. SAT-MOD-20160624-00060 (filed June 24, 2016) ("O3b Modification Application"); SAT-AMD-20161115-00116 (filed Nov. 15, 2016) ("O3b Amendment"); Space Norway AS, IBFS File No. SAT-LOI-20161115-00111 (filed Nov. 15, 2016) ("Space Norway Application"); Space Exploration Holdings, LLC, IBFS File No. SAT-LOA-20161115-00118 (filed Nov. 15, 2016) ("SpaceX Application"); Telesat Canada, IBFS File No. SAT-LOI-20161115-00108 (filed Nov. 15, 2016); Theia Holdings A, Inc. IBFS File No. SAT-LOA-20161115-00121 (filed Nov. 15, 2016); WorldVu Satellites Limited (d/b/a/ OneWeb), IBFS File No. SAT-LOI-20160428-00041 (filed Apr. 28, 2016); ViaSat NGSO Application.

<sup>22</sup> *NPRM* at ¶ 10.



### III. DEVELOPING APPROPRIATE RULES TO PROTECT GSO NETWORKS FROM NGSO INTERFERENCE IS CRITICAL

The *NPRM* suggests that compliance with certain limits reflected in Article 22 of the ITU *Radio Regulations* that were adopted in 2000 “will be sufficient for NGSO FSS systems to protect GSO FSS networks.”<sup>23</sup> Those limits attempt to constrain the EPFD, emitted by: (i) NGSO space stations toward GSO space stations; (ii) NGSO space stations toward GSO earth stations; and (iii) NGSO earth stations toward GSO space stations. The Commission proposes to incorporate these ITU technical limits into its Part 25 rules.<sup>24</sup>

Although ViaSat agrees conceptually that appropriate EPFD limits could be an effective means of facilitating the ability of NGSO systems to protect GSO networks from interference, it is not clear that the existing ITU limits are appropriate in the current circumstances that the Commission now faces:

- In light of the significant technological changes in GSO networks over the past two decades that provide increased spectrum efficiency and enable new types of services, it cannot be assumed that the existing ITU limits are adequate.
- The Commission’s experience with the current O3b configuration does not necessarily apply to the operating environment presented in the pending processing rounds for eleven different types of NGSO systems in just the Ka band.
- The ITU limits are based on a very small number of NGSO systems (3.5, to be exact) and any EPFD “allowances” may not easily be apportioned across the eleven different NGSO systems proposed in the current Ka-band processing round and the untold number to come in the V-band processing round.
- No mechanism has been proposed to ensure that any aggregate limits are honored and that critical GSO operations are protected.
- No rule has been proposed to limit aggregate interference in the uplink direction—into satellite receivers.

---

<sup>23</sup> *NPRM* at ¶ 19.

<sup>24</sup> *Id.*

Managing NGSO interference into GSO systems should be a critical element of this proceeding, in order to achieve the significant benefits that can be provided by both types of systems. These issues are addressed below.

**A. Managing Aggregate Interference from NGSO Systems into GSO Networks Is Essential**

As the Commission is well aware from the *Spectrum Frontiers* proceeding, the impact on GSO networks of aggregate interference from multiple, co-frequency transmitters emitting unwanted energy is a matter of significant concern, and one the Commission has committed to continue to study in that context.<sup>25</sup> Unfortunately, there is little discussion of this issue in the *NPRM* or how, specifically, to manage the risk of aggregate interference from all authorized NGSO systems into any particular GSO network.

Comments in the *Spectrum Frontiers* context reflect the seriousness of the issue and are equally applicable in this context:

- SES/O3b: “The Commission must address the risk of harmful aggregate interference to satellites.”<sup>26</sup>
- SES/O3b: “Reliable mechanisms must be put in place to ensure any future interference that does arise can be quickly and adequately resolved.”<sup>27</sup>
- EchoStar/Hughes: “[A]ggregate interference to space station receive antennas . . . creates potentially debilitating uncertainty for FSS operators and sets in motion a potential problem that cannot later be undone.”<sup>28</sup>

---

<sup>25</sup> *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Report and Order, 31 FCC Rcd 8014, at ¶ 69 (2016).

<sup>26</sup> Petition for Reconsideration of SES Americom, Inc. and O3b Limited, GN Docket No. 14-177; IB Docket Nos. 15-256 & 97-95; RM-11664; and WT Docket No. 10-112, at 19 (Dec. 14, 2016).

<sup>27</sup> *Id.* at ii.

<sup>28</sup> Comments of EchoStar Satellite Operating Corporation and Hughes Network Systems, LLC on Petitions for Reconsideration, GN Docket No. 14-177; IB Docket Nos. 15-256 & 97-95; RM-11664; and WT Docket No. 10-112, at 2-3 (Jan. 31, 2017).

The *NPRM* simply does not propose a complete, or even an adequate, way to manage the risk of aggregate interference into GSO networks from all of the NGSO systems the Commission may authorize in the pending processing rounds.<sup>29</sup> Providing this type of certainty is essential for all satellite operators—both GSO and NGSO—to avoid disruption to essential services and needless interference disputes before the Commission.

**B. Aggregate Limits for *Each Direction* Must Be Established and a Suitable Enforcement Mechanism Must Be Developed**

The EPFD limits proposed by the *NPRM* would be the sole mechanism adopted to provide interference protection of GSO networks from NGSO operations. As the *NPRM* explains: “We intend that compliance with EPFD limits in the Ka-band would satisfy any obligation on an NGSO FSS system to operate on a non-interference basis with respect to a GSO FSS networks.”<sup>30</sup> More specifically, the Commission proposes: (i) a rule governing the total EPFD from a *single NGSO system* in the space-to-space, space-to-Earth, and Earth-to-space directions;<sup>31</sup> and (ii) a rule governing the *aggregate EPFD in the downlink direction* (space-to-Earth) direction *from* all co-frequency space stations of *all NGSO FSS systems*.<sup>32</sup>

---

<sup>29</sup> ITU RR 22.5K provides that Administrations operating or planning to operate NGSO systems in certain frequencies should apply the provisions of Resolution 76 (rev. WRC-2015) to ensure that the actual aggregate interference into GSO networks caused by NGSO systems operating co-frequency does not exceed the aggregate power levels shown in Resolution 76 for the space-to-Earth, or downlink, direction. These mechanisms do not address precisely how such interference would be managed should it occur, nor do they address the effect of aggregate interference into GSO satellite receivers from the aggregate emissions of all earth station transmitters operating on a co-frequency basis across eleven or more NGSO systems.

<sup>30</sup> *NPRM* at ¶ 19 n.52.

<sup>31</sup> *NPRM* at Appx. A (proposed Sections 25.208(f), (g), (k)). These proposed rule sections reference the emissions from “all” relevant NGSO space stations. Proposed Section 25.208(e) references the “aggregate PFD produced by the entire authorized constellation.” ViaSat suggests replacing “aggregate” with “total” in proposed Section

However, no rule or other mechanism is proposed to manage the risk of aggregate interference into GSO satellite receivers from the potentially hundreds of thousands (or more) of earth stations that the Commission may license to communicate over the numerous NGSO systems that may be authorized through pending processing rounds. Stated another way, there is no proposed rule governing the aggregate EPFD in the Earth-to-space direction from all co-frequency earth stations of all authorized NGSO FSS systems. Nor is a mechanism proposed to ensure that suitable aggregate limits in the space-to-Earth, space-to-space, and Earth-to-space directions are honored and that critical GSO operations thus are protected. These omissions must be addressed.

**C. Any Aggregate EPFD “Allowances” Must Be Apportioned Across Eleven or More NGSO Systems in the Ka Band**

In the current Ka-band processing round, the Commission is faced with the possibility of either licensing or granting United States market access to eleven NGSO systems, each of which would contribute to the aggregate EPFD received by any given GSO network from co-channel NGSO operations. It remains to be seen how many V-band NGSO systems will be proposed by March 1 that would contribute to aggregate EPFD levels in the V band. The Commission has an obligation to ensure that the aggregate EPFD levels generated by all of the NGSO operations that it authorizes to and from the United States comply with applicable limits in order to protect GSO networks. A suitable methodology must be developed to apportion any aggregate EPFD “allowances” across various authorized NGSO systems.

---

25.208(e) because the term “aggregate” in the NGSO context is more commonly used as a term of art to refer to the sum of the relevant emissions from all NGSO constellations.

<sup>32</sup> *Id.* (proposed Section 25.208(h)).

**D. Prior Experience with One Type of NGSO System Has Limited Value in Managing the Many Different NGSO Systems Proposed to the Commission**

As the Commission is aware, it has operational experience applying the ITU's EPFD limits in only one case—the current configuration of the O3b system, which consists of 12 spacecraft operating in an equatorial orbit, and which therefore presents a relatively benign sharing environment with respect to the GSO arc. Specifically, O3b uses certain spectrum (18.8-19.3 GHz and 28.6-29.1 GHz) along the equator, and other spectrum (17.8-18.6 GHz and 27.5-28.6 GHz) elsewhere to avoid in-line events with the GSO arc. In stark contrast: (i) the current Ka-band NGSO processing round consists of proposals for eleven different NGSO systems, potentially operating co-frequency in portions of the Ka band, with about 4,000 NGSO spacecraft in a wide variety of orbits;<sup>33</sup> and (ii) it remains to be seen how many and what type of V-band NGSO systems will have been proposed when the V-band processing round closes.<sup>34</sup>

Nor does the work completed at the ITU thus far adequately address the situation created by the large number of NGSO systems already proposed and likely to be proposed in the near future. As an initial matter, ITU Resolution 76 (Rev. 2015) calls for administrations to “take all possible steps” to ensure that the aggregate interference into GSO networks caused by NGSO systems does not exceed certain specified aggregate power levels, but those limits do not apply to the Earth-to-space (or uplink) direction, and thus do not address the aggregate effect of NGSO uplink interference into GSO satellite receivers. More fundamentally, the ITU limits adopted in

---

<sup>33</sup> See *supra* pp. 10-11 & n.21.

<sup>34</sup> See Public Notice, Satellite Policy Branch Information, Boeing Application Accepted for Filing in Part IBFS File No. SAT-LOA-20160622-00058, Cut-Off Established for Additional NGSO-Like Satellite Applications or Petitions for Operations in the 37.5-40.0 GHz, 40.0-42.0 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz Bands, DA 16-1244 (rel. Nov. 1, 2016); *see also* The Boeing Company, IBFS File No. SAT-LOA-20160622-00058 (filed June 22, 2016) (“Boeing V-Band Application”).

2000 assume that the number of NGSO systems at issue is small (3.5, to be precise),<sup>35</sup> and do not take into account the possibility of the eleven NGSO systems currently proposed in the Ka-band processing round, or the untold additional systems that will have been proposed by the time the V-band processing round closes in March. In any event, in a case like this where a single administration is effectively authorizing the operation of eleven or more NGSO systems (and their associated earth stations) within its jurisdiction, there undoubtedly is a separate obligation to manage the risk of aggregate interference into GSO networks.

Considering the nature and scope of the NGSO systems in the pending Ka-band processing round alone, it is obvious that those systems present interference risks with respect to GSO operations that were neither previously contemplated nor examined in establishing either the (incomplete) EPFD limits proposed in the *NPRM*, or the ITU's framework for attempting to manage this issue. The *NPRM* acknowledges this concern in discussing the need to suitably protect terrestrial services from NGSO interference,<sup>36</sup> but does not address the same concern in the context of protecting GSO networks from NGSO interference.

In order to ensure that GSO networks are adequately protected from the aggregate EPFD produced by all of the NGSO systems that may be authorized in the current Ka-band and V-band processing rounds, it is essential to evaluate the aggregate impact of all such NGSO systems and develop appropriate rules accordingly.

---

<sup>35</sup> See ITU Res. 76 (Rev. 2015) (noting that “single-entry validation limits have been derived from aggregate epfd masks contained in Tables 1A to 1D, assuming a maximum effective number of non-GSO FSS systems of 3.5”).

<sup>36</sup> *NPRM* at ¶ 16 (“We recognize, however, that these limits were derived for constellations up to a certain number of satellites and may not be appropriate for some of the large NGSO FSS constellations being currently proposed.”).

#### **E. The Continued Adequacy of Existing ITU Limits Cannot Be Assumed**

The ITU's EPFD limits were developed almost two decades ago based on satellite technologies and network architectures that were prevalent at the time. There is no basis to simply assume that those same limits would adequately protect newer GSO networks from interference generated by NGSO systems. In general, newer satellites are likely to be more spectrally efficient and employ lower total satellite receiver noise temperatures and higher satellite receive antenna gain than legacy satellites.<sup>37</sup> Such GSO characteristics were not considered in generating the ITU EPFD limits adopted in 2000. Consequently, different EPFD limits might be necessary to ensure the compatibility of NGSO systems with the types of GSO networks that will be deployed on a going-forward basis.

Notably, other portions of the *NPRM* specifically recognize that the passage of time and the evolution of satellite technology could impact whether a technical rule adopted decades ago remains appropriate today. Specifically, in inviting comment on whether the 10-degree "trigger" angle for in-line events should be altered, the Commission explains that this threshold "is based on the characteristics of satellite systems proposed around the turn of the millennium" and suggests that it may be appropriate to narrow that angle as a result.<sup>38</sup> Similarly, it is imperative that this proceeding evaluate the ITU's EPFD limits anew to determine if they remain appropriate in light of current GSO technology. The Commission should not just reflexively incorporate those limits by reference.

---

<sup>37</sup> See ViaSat, Inc. Notice of *Ex Parte* Presentation; GN Docket No. 14-177; IB Docket Nos. 15-256 & 97-95; RM-11664; and WT Docket No. 10-112, Att. 1 at 2 (Apr. 21, 2016).

<sup>38</sup> *NPRM* at ¶ 26.

#### **IV. CHANGING CERTAIN NGSO LICENSING RULES COULD CONSTRAIN THE ABILITY TO PROVIDE INNOVATIVE NGSO SERVICES**

The *NPRM* proposes a number of changes to long-standing Commission rules for licensing NGSO systems. While it is appropriate to examine those possible changes based on developments and experiences since the underlying rules were first adopted, it also is appropriate to assess whether the proposed rule changes would affect some types of NGSO systems more than others, and whether those changes would constrain, rather than enhance, the ability to provide certain services.

The *NPRM* asks whether the Commission should, in assigning spectrum to various NGSO systems, expand the application of the “avoidance of in-line interference events” mechanism described in Section 25.261 to the spectrum assignment process, instead of using the procedure specified in Section 25.157 for simply dividing the spectrum equally among the qualified applicants in a processing round.<sup>39</sup> While ViaSat believes the “avoidance of in-line events” mechanism can facilitate spectrum sharing in certain cases, it also can significantly constrain the operation of certain NGSO systems.

By way of example, applying the “avoidance of in-line interference” mechanism to assign spectrum to proposed “mega-constellations” can have a dramatic adverse impact on how smaller NGSO constellations would operate. In its comments on Boeing’s V-band NGSO application, ViaSat submitted a preliminary analysis estimating the probability of an in-line interference event between the 2,956-satellite Boeing system and the 24-satellite VIASAT-

---

<sup>39</sup> *Id.* at ¶ 23.



NGSO system (without studying any other NGSO system). That analysis estimated, under conservative assumptions, that such in-line events would occur 46.7 percent of the time.<sup>40</sup>

Exhibits 1 and 2 provide further illustrations of how relying on the “avoidance of in-line interference” mechanism to assign spectrum can impact the coverage and capacity of smaller systems. Specifically, Exhibit 1 demonstrates that the need to protect Boeing’s system during in-line events would significantly reduce the probability of a given location being covered by ViaSat’s NGSO system at any given point in time, to less than 50 percent in large parts of the United States.<sup>41</sup> In contrast, Boeing’s coverage would not be materially impacted by the need to protect the much smaller ViaSat system. Similarly, Exhibit 2 demonstrates that the need to protect Boeing’s system would significantly reduce the average number of ViaSat satellites visible from a given location at any point in time, and therefore would significantly reduce the available capacity provided by the ViaSat NGSO system. Again, in stark contrast, Boeing’s available capacity would hardly be impacted at all by the need to protect ViaSat’s NGSO system. In other words, only one of the two systems shoulders the burden of “frequency sharing” in this scenario. That is not an equitable result.

ViaSat recommends that the Commission investigate these dynamics fully, with respect to all of the systems proposed in the current processing rounds, before applying the “avoidance of in-line interference” mechanism to the assignment of spectrum to NGSO systems. In

---

<sup>40</sup> Comments of ViaSat, Inc., IBFS File No. SAT-LOA-20160622-00058, at 3 and Ex. A (Dec. 1, 2016). That preliminary analysis is based on applying Section 25.261 of the Commission’s rules, which addresses in-line interference events between NGSO FSS networks, and provides a reasonable proxy for evaluating the potential for co-frequency spectrum conflicts among different NGSO networks.

<sup>41</sup> Data from the U.S. Geological Survey establishes that the contiguous United States extends from approximately 23° N to approximately 52° N. *See NASA Web-Enabled Landsat Data – CONUS Lat/Long (WELDUSLL)*, available at <https://lta.cr.usgs.gov/weldusll.html> (last visited Feb. 23, 2017).

particular, the Commission should ensure that all of the trade-offs involved in relying on “avoidance of in-line interference” versus “band splitting” are fully understood, and ensure that the burdens of spectrum sharing are equitably distributed among all NGSO systems.

That trade-off analysis should also consider the consequences of possibly reducing the “angular separation between co-frequency space station operations” used to define in-line interference events, because defining the “trigger” for when an in-line event occurs can affect the coverage and capacity issues described above. Similarly, it is important to fully examine the assumption that imposing “default limits” on off-axis emissions from NGSO earth stations would produce positive benefits.<sup>42</sup> Doing so potentially could foreclose operators from providing services that require earth stations to operate with higher off-axis EIRP densities—*e.g.*, services that employ small mobile terminals.

## **V. RELAXING THE NGSO MILESTONE REQUIREMENT COULD ADVERSELY AFFECT THE NGSO SHARING ENVIRONMENT**

The Commission’s NGSO milestone requirement is a cornerstone of its policies for ensuring the efficient use of spectrum resources. As the *NPRM* explains, the “milestone requirement is intended to ensure timely provision of service, and to prevent ‘warehousing’ of spectrum and orbital resources.”<sup>43</sup> Because operators risk losing their licenses, as well as surety bonds, if milestones are not met, they have incentives to efficiently use spectrum resources in a timely fashion under current rules.

The *NPRM* proposes to loosen the existing NGSO milestone by requiring operators to deploy a fixed percentage (*e.g.*, 75 percent) of satellites after six years (or risk losing their

---

<sup>42</sup> *NPRM* at ¶ 28.

<sup>43</sup> *Id.* at ¶ 31.

authorizations and surety bonds) and to deploy the remaining satellites after nine years (or risk losing their authorizations only *for those remaining satellites*).<sup>44</sup> The *NPRM* proposes this change in light of the Commission’s belief that “every space station in an authorized constellation . . . may not be necessary to provide the services proposed in the application.”<sup>45</sup>

Before it implements any milestone change, the Commission should consider the implications for *other* NGSO operators, and the sharing environment more generally. Regardless of whether every satellite in an authorized NGSO constellation is necessary to provide proposed services, every such NGSO satellite potentially limits (or may even preclude) the ability of other NGSO operators to provide service to the public.

As discussed above, the “mega-constellations” proposed by Boeing and others could impose significant constraints on the operations of smaller NGSO systems. More specifically, smaller NGSO systems (like ViaSat’s) would lose significant coverage and capacity due to the need to protect such mega-constellations during in-line events. Changing the milestone requirements to allow the phased deployment of such mega-constellations—and effectively give their operators an option to deploy a significant percentage of their large constellations (*e.g.*, 25 percent) *after* other NGSO operators have had to make made adjustments to accommodate those large constellations—would materially impact the NGSO sharing environment. Applying the existing “band-splitting” rule in a case like this, rather than requiring that the smaller system resort to “in-line avoidance,” would facilitate more equitable spectrum sharing by not requiring that a small NGSO system (designed to provide full coverage) significantly reduce its service simply to accommodate a much larger system with limited geographic coverage. The

---

<sup>44</sup> *Id.* at ¶ 32.

<sup>45</sup> *Id.*

Commission should factor these effects into its analysis. To the extent that the Commission seeks to “afford operators greater flexibility with system design and implementation,”<sup>46</sup> the Commission should consider alternatives that could better realize the Commission’s objectives without adversely impacting the sharing environment and the operations of other NGSO systems.

## **VI. SIGNIFICANT NGSO RULE CHANGES COULD INEQUITABLY AFFECT APPLICANTS IN THE CURRENT NGSO PROCESSING ROUNDS**

The *NPRM* proposal to change a number of fundamental aspects of the Commission’s baseline licensing rules and application requirements for NGSO systems has significant implications for network design. For example, the *NPRM* proposes to eliminate the existing global coverage requirement “to provide operators greater flexibility to design their systems to meet market demands.”<sup>47</sup> As the *NPRM* acknowledges, the existing rule is intended to “maximize the use of global spectrum resources,”<sup>48</sup> and the global coverage requirement precludes the use of certain NGSO system designs.<sup>49</sup>

Although rule changes of this type may provide additional flexibility, as a practical matter, only certain operators—namely, those that have already sought waivers of the existing rule(s) in their pending NGSO system applications<sup>50</sup>—are likely to benefit from the rule change. The proposed rule changes therefore threaten to create inequities among applicants and reward operators that were unwilling to comply with the Commission’s rules in the first instance.

---

<sup>46</sup> *Id.*

<sup>47</sup> *Id.* at ¶ 35.

<sup>48</sup> *Id.*

<sup>49</sup> *Id.*

<sup>50</sup> *See, e.g.*, Boeing Ka-Band Application at 21, 37; Boeing V-Band Application at 36-37, 65-66; Audacy Application at 44; O3b Modification Application at 10-11; O3b Amendment at 9-10; Space Norway Application at 11-12; SpaceX Application at 13-14.

For example, if the global coverage requirement had not existed, ViaSat would have been able to design an NGSO system utilizing orbits that would have facilitated its ability to provide even more innovative services to the public. Specifically, ViaSat could have focused more capacity over the United States and could have done so at a greatly reduced cost to the end user. Instead, ViaSat optimized its network design to satisfy the global coverage requirement and the other constraints imposed by longstanding Commission rules. The failure to comply with those rules could have resulted in ViaSat's application being dismissed as incomplete or defective, and ViaSat being kicked out of the processing round.

Allowing some applicants to sidestep the requirements of existing rules through post-cutoff-date rule changes would place other applicants at an unfair disadvantage—both competitively and in the coordination negotiations that will inevitably flow from the pending processing rounds. It is no answer to suggest that a pending applicant can simply amend its application to take advantage of a significantly decreased coverage requirement. Employing a fundamentally different NGSO constellation with a different orbital architecture could require new ITU filings as well, and therefore affect matters that are outside the Commission's jurisdiction. Fundamental fairness mandates equitable treatment of all applicants in the processing round. Disguising waivers of longstanding application requirements and baseline processing round qualifications through *post-hoc* rule changes would be fundamentally unfair.

## **VII. CONCLUSION**

ViaSat supports the Commission's efforts to: (i) provide greater operational flexibility for GSO FSS space stations; and (ii) update, clarify, and streamline the licensing framework governing NGSO systems. At the same time, the *NPRM* represents the first attempt to comprehensively revise the Ka-Band Plan and the NGSO licensing rules in nearly two decades,

during which time both NGSO and GSO technologies—and the operating environment more generally—have evolved significantly. Moreover, the possibility of authorizing eleven NGSO systems in the current Ka-band processing round, and a yet-to-be determined number in the V-band processing round, presents circumstances that have not yet been fully evaluated in developing the *NPRM*.

ViaSat therefore recommends that the Commission reexamine its Ka-Band Plan and its NGSO licensing framework more comprehensively by:

- More broadly considering ways to promote efficient use of underutilized Ka-band resources, including consideration of the 19.4-19.6 GHz and 29.1-29.25 GHz band segments.
- Examining the assumption that decades-old ITU limits are adequate for purposes of managing NGSO interference into GSO systems, given intervening technological developments and the proposals to launch many more, and much larger, NGSO constellations than were examined in developing those ITU limits.
- Developing a mechanism to ensure that aggregate interference limits on NGSO systems are honored and critical GSO operations are protected.
- Evaluating how changing some NGSO licensing rules for some system operators could constrain the ability of other NGSO systems to provide innovative services.
- Considering how significantly relaxing the NGSO milestone requirement could adversely affect the NGSO spectrum sharing environment.
- Addressing the inequitable impact on some proposed NGSO systems of changing baseline NGSO licensing rules after the processing round filing windows have closed.

The scope of the Commission’s inquiry in this *NPRM* can and should be expanded to account for these issues, many of which are critical for setting the terms on which the limited spectrum resource will be used by a variety of NGSO systems that will have expected lifetimes of fifteen years or more. If these issues are not addressed now, there may be no realistic opportunity to address them again in the near future.

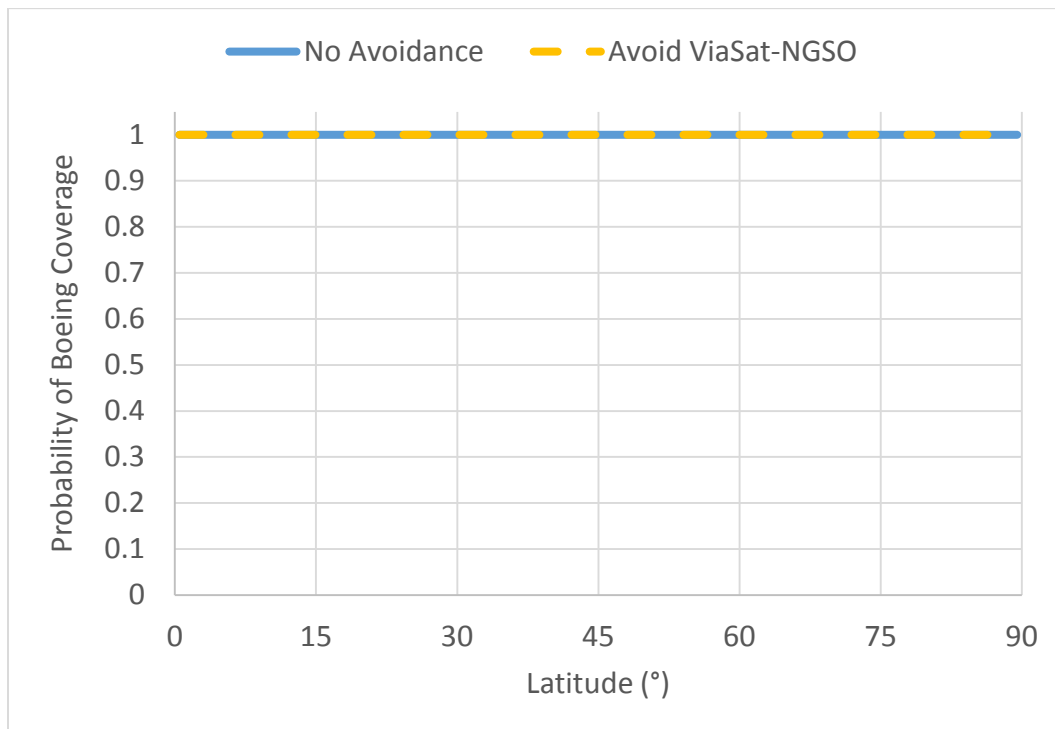
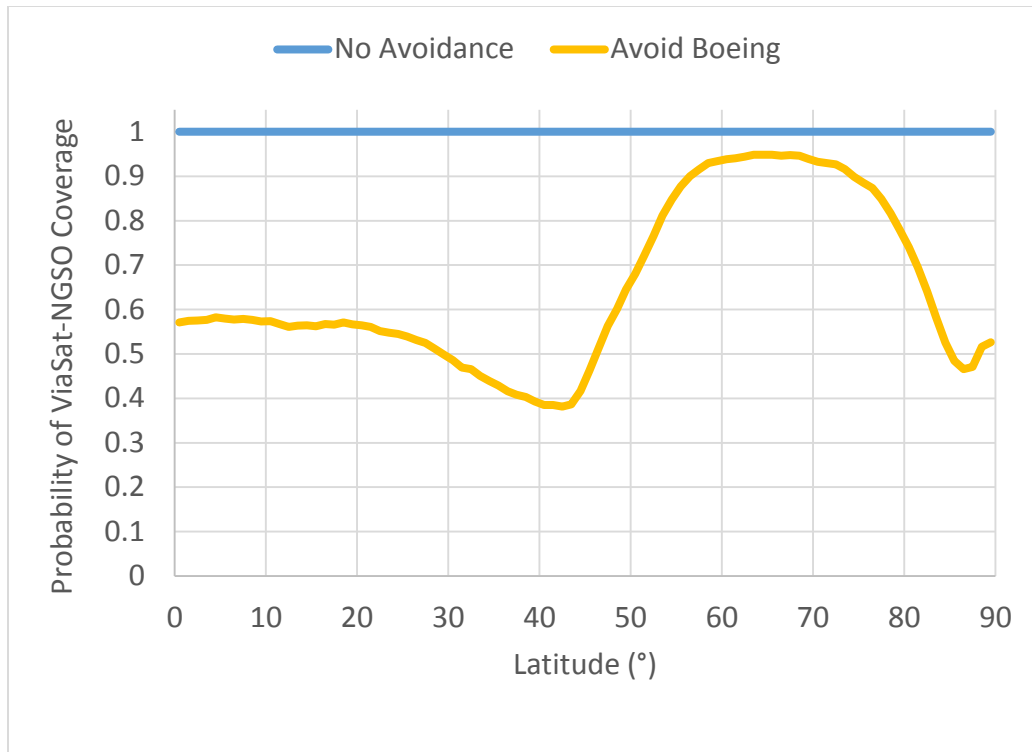
Respectfully submitted,

Christopher Murphy  
Associate General Counsel, Regulatory  
Affairs  
Daryl T. Hunter  
Senior Director, Regulatory Affairs  
Christopher Hofer  
Director, Regulatory Affairs  
VIASAT, INC.  
6155 El Camino Real  
Carlsbad, CA 92009

/s/  
\_\_\_\_\_  
John P. Janka  
Elizabeth R. Park  
Jarrett S. Taubman  
LATHAM & WATKINS LLP  
555 Eleventh Street, NW, Suite 100  
Washington, DC 20004  
  
*Counsel to ViaSat, Inc.*

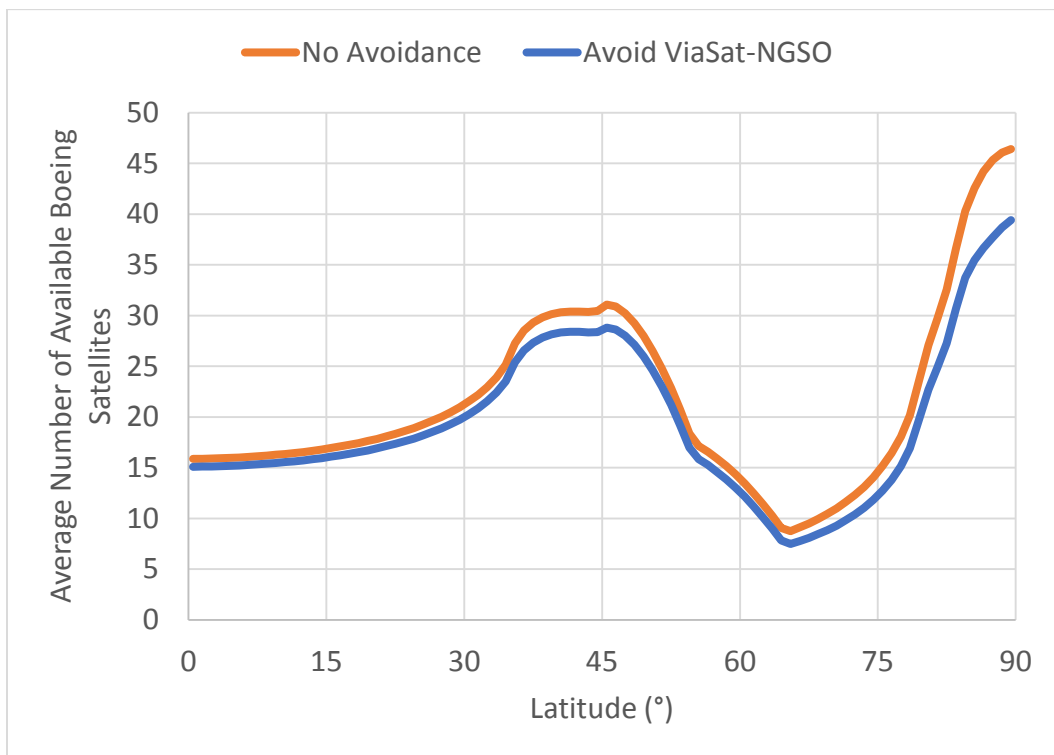
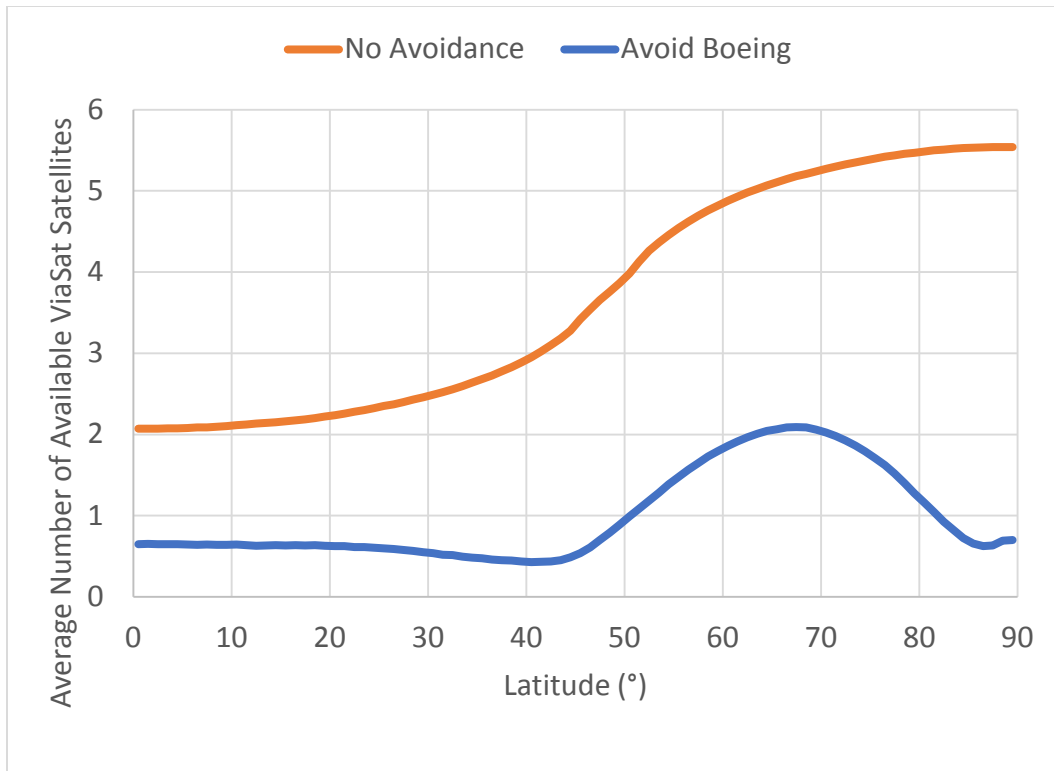
February 27, 2017

**Exhibit 1: Impact of Mutual Avoidance on Coverage**





**Exhibit 2: Impact of Mutual Avoidance on Capacity**



## DECLARATION

I hereby declare that I am the technically qualified person responsible for preparation of the engineering information contained in these Comments of ViaSat, Inc. ("Comments"), that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted with these Comments, and that it is complete and accurate to the best of my knowledge, information and belief.



A handwritten signature in blue ink that reads "Daryl T. Hunter". The signature is written over a horizontal line.

Daryl T. Hunter, P.E.  
Senior Director, Regulatory Affairs  
ViaSat, Inc.  
6155 El Camino Real  
Carlsbad, CA 92009

February 27, 2017